

REMARKS

Claims 1-14 are pending in the present application, with claims 12-14 having been withdrawn from consideration by the Examiner as being directed to a non-elected invention. Reconsideration of claims 1-11 in light of the remarks and amendments made herein is respectfully requested.

The present invention is directed to an electrolysis cell for electrolyzing water to transform it into Free Radical Solution (FRS) water. [abstract]. The electrolysis cell includes a pair of flat electrodes coupled to (for example, fixedly attached or coated onto) a flat proton ion exchange membrane. [para. 0009]. The flat proton ion exchange membrane is placed in between the two flat electrodes. In one embodiment, the electrodes are flat mesh electrodes. [para. 0023]. This configuration, as claimed, provides improved water flow around ion exchange membranes and electrodes with increased production of electrolyzed water for use in generating electric energy. [paras. 0005, 0007 and 0009].

Claim Rejection under 35 U.S.C. §103

The Office Action rejected claims 1-9 and 11 under 35 U.S.C. §103(a) as being unpatentable over *Ezzell et al.* (U.S. Pat. No. 4,265,719) in view of *Giuseppe* (EP 0276789). Applicants respectfully traverse.

The Cited References Teach Away From Each Other***Independent claim 1***

The Office Action rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over *Ezzell* in view of *Giuseppe*. Independent claim 1 recites “a flat proton ion exchange membrane placed in between and fixedly attached to two flat mesh electrodes.”

The Office Action concedes: “Ezzell fails to explicitly disclose wherein the membrane is placed in between and fixedly attached to the electrodes and a commuting guide having at least one channel for facilitating solution flow towards the first outlet channel.” Applicant agrees.

For satisfaction of this limitation, the Office Action relies on *Giuseppe*, which discloses:

The cathode compartment comprises a cathode C and a distributor D, which presses cathode C against the membrane M which is supported by the anode A : this mechanical arrangement permits to avoid vibrations of the membrane during operation, and thus avoids damaging of the membrane due to abrasions or fatigue.

However, *Ezzell* teaches away from the configuration of *Giuseppe* in which a cathode is pressed against a membrane.

Ezzell is directed to an electrolysis of aqueous solutions employing a flexible membrane. [title]. The electrolysis cell 10 has an anolyte 14 and a catholyte 15 compartment with electrodes “vertically suspended” therein. [col. 4, lines 14-25]. The electrodes 13, 16 are welded to metal studs 117, 121 for structural support and electrical connection. *Id.* These metal studs 117, 121 are attached to the opposite side walls of the electrolysis cell housing 11a.

According to *Ezzell*, during hydrolysis, gas bubbles are formed on the cathode surface 16, creating “a quite erratic flowpath” that makes “it quite improbable that the somewhat floppy membrane 12 maintains a constant intimate contact with the cathode 16.” [col. 5, lines 32-41]. *Ezzell* notes that “[w]hen the cell is in operation, it is not certain whether the membrane maintains contact with the adjacent cathode surface or not due to the bubbles rising therebetween.” [col. 6, lines 34-37].

Ezzell disparages configurations in which an anode surface shares significant contact with a membrane. *Ezzell* teaches that a “voltage penalty” is incurred when the membrane is in contact with the anode, rather than the anolyte:

This increase in voltage, i.e., the increase in cell voltage incurred when operating the cell with the membrane pressurized against the cathode by the anolyte as opposed to the cell voltage incurred when operating the cell with the membrane contacting the anode, will be referred to and defined herein as “voltage penalty”. [col. 1, lines 37-43].

To avoid this voltage penalty, which *Ezzell* disparages, *Ezzell* discloses that a pressure should be maintained to cause the membrane to have minimal contact with the cathode and to avoid any contact with the anode:

By maintaining the anolyte pressure greater than the catholyte pressure and employing a cathode surface facing the membrane which has protuberances and indentations thereon and therein, it has been discovered that only a relatively small voltage penalty is incurred during cell operation while preventing flow of hydrogen gas from the catholyte chamber through any holes in the membrane into

the anolyte compartment wherein it can form an explosive gaseous mixture with the chlorine gas generated therein. [col. 2, lines 51-60].

Furthermore, *Ezzell* disparages configurations in which a cathode surface shares significant contact with a membrane. *Ezzell* teaches that a “voltage penalty” is incurred when significant contact between the membrane and the cathode occurs: “The upper limit of theoretically available contact area contemplated is about 20%. Preferably cathode surfaces are used with less than about 10% of such theoretically available contact area. As this contact area decreases, so does the voltage penalty.”

For the foregoing reasons, *Ezzell* teaches away from a combination with *Giuseppe* because it criticizes and disparages the penalties of a configuration in which the membrane has any contact with the anode and in which the membrane has significant contact with the cathode. Applicants kindly request reconsideration of claim 1.

Dependent claims 2-9

The Office Action rejected claims 2-9 under 35 U.S.C. § 103(a) as being unpatentable over *Ezzell* in view of *Giuseppe*. Dependent claims 2-9 depend from independent claim 1. As the independent claim from which they depend is patentable, as discussed herein, claims 2-9 rejected under 35 U.S.C. § 103 as unpatentable over *Ezzell* in view of *Giuseppe* are patentable. Reconsideration is kindly requested.

Dependent claim 10

The Office Action rejected claim 10 under 35 U.S.C. § 103(a) as being unpatentable over *Ezzell* in view of *Giuseppe*, as applied to claim 1 above, and further in view of *Sumita* (U.S. Patent no. 7,090,753).

Claim 10 depends from claim 1. The Office Action states: “With regard to claim 10, the modified *Ezzell* discloses all of the features, as applied to claim 1 above, but fails to teach wherein the cell further comprises an Oxidation Reduction Potential (ORP) sensor for measuring the ORP level of the solution.”

Therefore, except with regard to the limitation of “an Oxidation Reduction Potential (OPR) sensor”, the Office Action does not identify additional or alternative grounds addressing

the limitations presented in claim 1, from which claim 10 depends. Specifically, the Office Action does not assert or support that *Sumita*, alone or in combination with other references, satisfies the limitation of “a flat proton ion exchange membrane placed in between and fixedly attached to two flat mesh electrodes,” presented in claim 1. Thus, Applicant respectfully submits that claim 10 is patentable for the same reasons advanced above with respect to claim 1. Reconsideration is kindly requested.

Independent claim 11

The Office Action rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over *Ezzell* in view of *Giuseppe*. Independent claim 11 recites “a flat proton ion exchange membrane, a first flat electrode and a second flat electrode, the flat proton ion exchange membrane having a first side and a second side, the first flat electrode coated on the first side of the flat proton ion exchange membrane and the second flat electrode coated on a second side of the flat proton ion exchange membrane.”

The Office Action concedes: “Ezzell fails to explicitly disclose wherein the first electrode is coated on one first side of the membrane and the second electrode coated on the second side of the membrane.” Applicant agrees.

For satisfaction of this limitation, the Office Action relies on *Giuseppe*, as with the rejection of claim 1.

As discussed above, *Ezzell* teaches away from the configuration of *Giuseppe* in which a cathode is pressed against a membrane. Because the Office Action relies on the combination of *Ezzell* and *Giuseppe* for its rejection of claim 11, Applicant respectfully submits that claim 11 is patentable for the same reasons advanced above with respect to claim 1.

For the above reasons, reconsideration of claim 11 is kindly requested.

Applicants respectfully submit that all the claims remaining in the application are now in condition for allowance, and respectfully requests that the application be passed to issue. Should any residual matters left to be resolved, the Examiner is invited to contact the undersigned agent at 949.732.6581 (office) at his/her convenience.

The Director is authorized to charge any additional fee(s) or any underpayment of fee(s), or to credit any overpayments to **Deposit Account Number 50-2638**. Please ensure that Attorney Docket Number 075772-010500 is referred to when charging any payments or credits for this case.

Respectfully submitted,

Date: February 10, 2009

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